

# Fine Structure of the Eye of the Prosobranch Mollusk *Littorina scutulata*

BY

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(5 Plates)

## INTRODUCTION

THE EYE, SITUATED on the ocular bulge at the base of each of the two tentacles on the head of the winkle, *Littorina littorea* Linnaeus, 1758 was described by NEWELL (1965) using light microscopy. CHARLES (1966), citing an unpublished electron microscopic study by Owen & Charles, provided additional information on the fine structure of these eyes.

The eyes at the tips of the posterior tentacles on the head of the garden snail *Helix aspersa* Müller, 1774, have been more completely described by BRANDENBURGER & EAKIN (1970) and EAKIN & BRANDENBURGER (1967a, 1967b, 1967c).

The present study describes the fine structure of the eyes of another littorine, *Littorina scutulata*, and compares these structures to those of *L. littorea* and *Helix aspersa*.

## MATERIALS AND METHODS

Specimens of *Littorina scutulata* Gould, 1848, were collected intertidally at Bodega Head on the northern California coast.

The eyes of these snails were removed and fixed for 1 hr at room temperature in 4% glutaraldehyde and 0.15M, pH 7.3 sodium cacodylate buffer in 0.15M sodium chloride, washed for 30 minutes in 0.15M sodium cacodylate buffer and 0.15M sodium chloride, and postfixed for 1 hr in ice cold 2% OsO<sub>4</sub> in 0.15M sodium cacodylate buffer and 0.15M sodium chloride. Dehydration in ethanol and propylene oxide was followed by Epon embedding.

One  $\mu$ m thick sections were mounted on glass slides and stained with 1% toluidine blue in 1% borax for light microscopy.

Silver ultrathin sections were mounted on coated grids and stained for 30 minutes in uranyl acetate and 5 minutes in lead citrate. Electron micrographs were taken with a Zeiss EM 9A.

## RESULTS

Each of the two eyes of *Littorina scutulata* is located in an ocular bulge at the base of a tentacle. Covering each is a transparent skin (cornea) composed of columnar epithelial cells bearing microvilli at their tips. The eye, encapsulated by dense connective tissue, is embedded in the connective tissue and muscle layer beneath the cornea. Light reaches the retina lining the concavity of the eye by passing through the pupil and then through the lens which fills the concavity of the eye (Figure 1).

The retina, composed of sensory and supportive cells, is divided into 3 zones: nuclear, heavily pigmented, and photoreceptor. The nuclear zone is lightly pigmented and contains the nuclei of the supportive and sensory cells. The supportive cells are narrow in this zone, containing little more than their darkly staining, irregularly shaped nuclei and a few melanosomes (Figure 2). The sensory cells fill the broad spaces between the narrow supportive cells and in this region contain mitochondria, rough and smooth endoplasmic reticula, free ribosomes, single and clustered granules, and a large number of membrane-bounded vesicles about 800 Å in diameter, in addition to large, lightly staining, spherical nuclei (Figure 3). The nuclei of supportive cells are more irregularly shaped and contain more heterochromatin.

In the pigmented zone, slender extensions of the sensory cells interdigitate in a complex manner with heavily pigmented columns of supportive cells. In this region the sup-

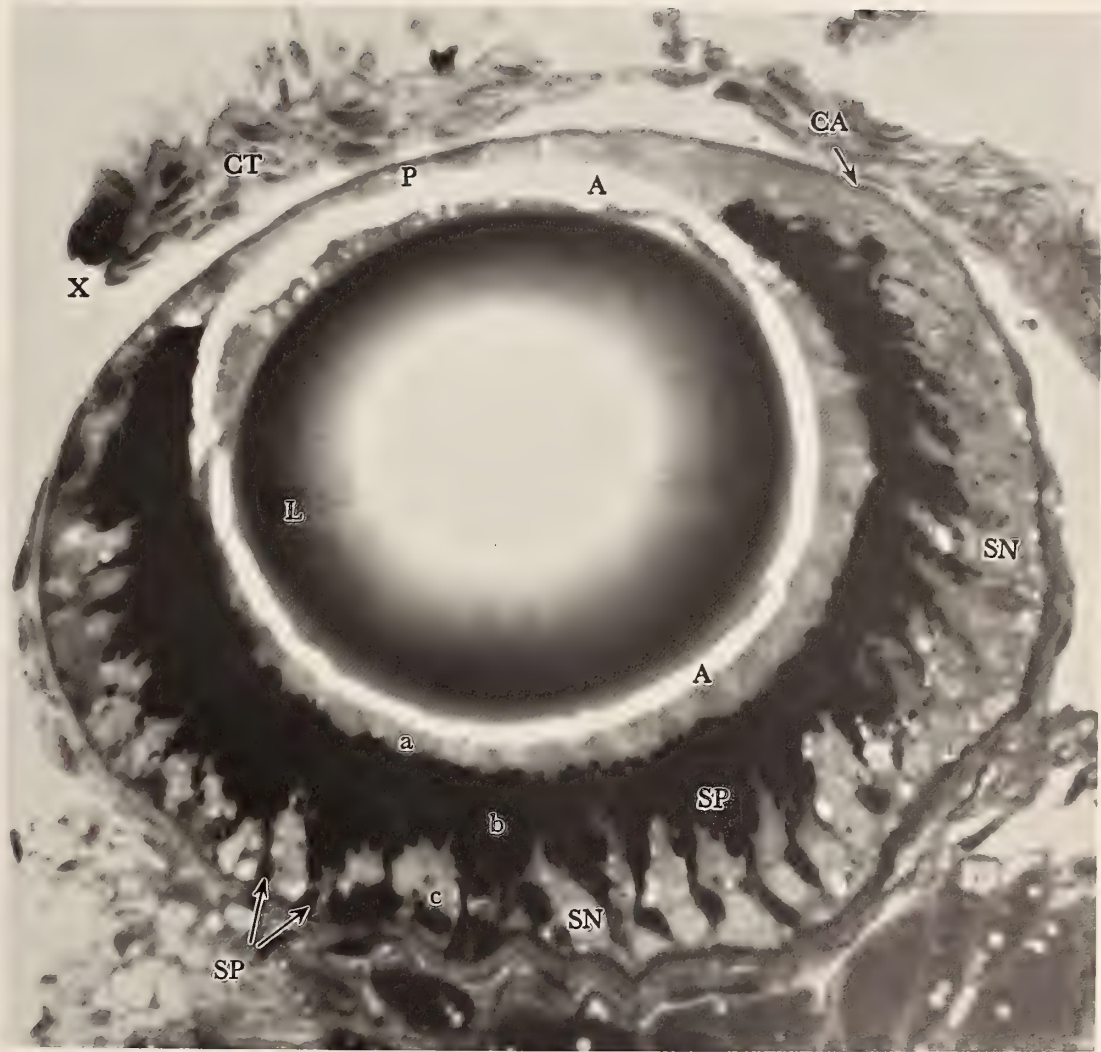


Figure 1

Light micrograph of the eye showing: pupil (P), lens (L), the central region of which has not been preserved, shrinkage artifact (A), sensory cells (SN), supportive cells (SP), capsule (CA), connective tissue (CT), which has been cut at X, photoreceptor zone (a), heavily pigmented zone (b), and nuclear zone (c).  $\times 1000$

